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MANAGEMENT AUDIT REPORT
of the
BUREAU OF STREET LIGHTING

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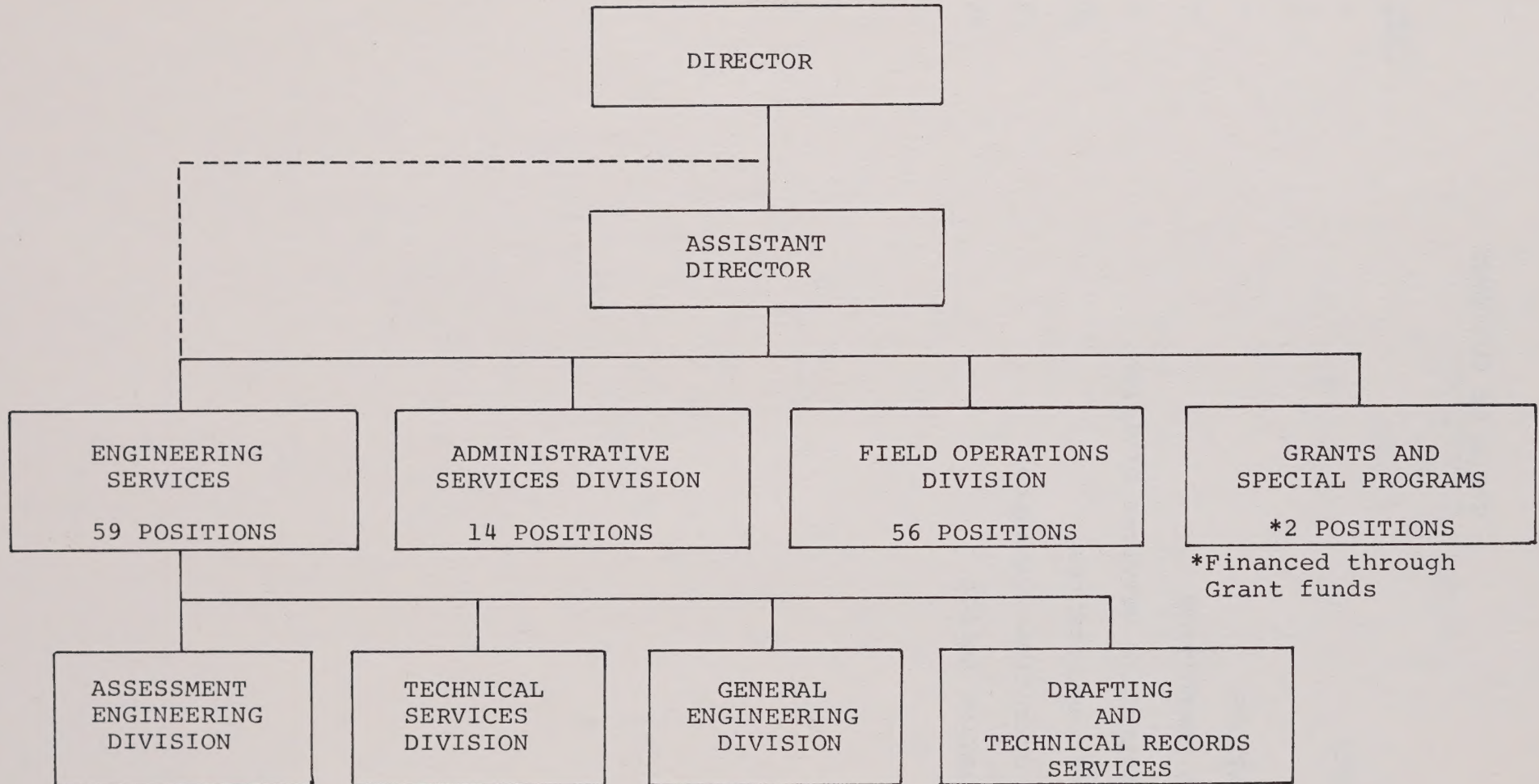
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BUREAU OF STREET LIGHTING
1977-78




INTRODUCTION

The Bureau of Street Lighting is one of the bureaus of the Department of Public Works. It has the responsibility for constructing, maintaining, repairing, and replacing street light installations. To accomplish its work, the Bureau is organized into five divisions: General Engineering, Assessment Engineering, Technical Services, Field Operations, and Administrative Services as set forth in the accompanying organization chart. The Bureau prepares plans, specifications and cost estimates for both new installations and major repairs. Both failure and damage repair work is done by Bureau forces. New construction is accomplished either by contract or by Bureau forces. Maintenance work is accomplished primarily by the Department of Water and Power and includes changing light bulbs, cleaning electroliers and doing emergency night time repair.

Two basic types of street lighting installations are used in the City, electrolier lighting and utilitarian lighting. The electrolier lighting systems are owned by the City. For the most part, the installation costs for these systems are borne either by the benefitting property owner or shared by the City and the property owner. In new developments the developer is required to install street lights. In developed areas street lights are installed through assessment proceedings. The cost of improved safety lighting at certain hazardous locations is borne entirely by the City.

Utilitarian lighting provides for minimum safety lighting only. In these facilities, the lights are placed on Department of Water and Power utility poles and are spaced much farther apart than those in electrolier systems. The utilitarian lighting installations are owned by the Department of Water and Power, although the operating costs in accordance with the Electric Rate Ordinance are paid from General City Funds.

The Bureau's 1977-78 Budget is \$5,014,243 and authorizes 131 regular full-time positions, two grant funded positions, and seven CETA positions as follows:



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<u>Program</u>	<u>Regular Positions</u>	<u>Budget</u>	<u>Percent</u>	<u>Grant Funded</u>	<u>CETA</u>
Design and Construction	38	\$ 2,852,403	57%	--	--
Systems Operation, Maintenance and Repair	53	1,495,745	30%	2	5
General Administration and Support	40	666,095	13%	--	2
Total	<u>131</u>	<u>\$ 5,014,243</u>	<u>100%</u>	<u>2</u>	<u>7</u>

Related costs of \$10,274,417 are included in other budget appropriations.

This is the third management audit of the Bureau of Street Lighting; the first having been conducted in 1966 and the second in 1971. Personnel at various levels were interviewed and their general cooperation facilitated the audit effort.

This audit has not addressed the issue of organizational placement of the Bureau within the City structure in light of the treatment of the subject in the Public Works Management Audit.

The Public Works liaison Commissioner for the Bureau of Street Lighting and the Bureau Director have reviewed this report and generally concur in its findings and recommendations. However, the Department specifically does not agree with the findings upon which Recommendation No. 5 is based; nor is there agreement with Recommendation No. 8 and the related findings.

SUMMARY

A review of the functions assigned to the Administrative Services Division reveals that, in general, responsibilities are carried out adequately and in compliance with applicable Executive Directives and CAO rules. However, insufficient attention has been directed to the functions of records management and Bureau accounting operations. Improvements in these functions require technical expertise not available in the Bureau of Street Lighting.

The usefulness of the Bureau's Personnel Utilization Report is currently limited because of excessively detailed functional breakdowns and other problems. Plans should be made to analyze the problem areas and improve the system. Under current procedures, information pertaining to the Bureau's proposed program for replacement of obsolete street lighting systems is not provided for consideration during the annual budgeting process. Provision should be made for submission of proposed Systems Replacement Projects and Energy and Cost Conservation Projects as a part of future budget requests.

The quality of work produced in the engineering divisions of the Bureau remains high as was the case in the 1971 audit, but the productivity has been low in recent years due to significant reductions in the level of engineering activities without corresponding reductions in the staffing of Engineering Services employees. Considerable time is required for the processing of assessment districts which are being initially assessed for street lighting maintenance. Delays in the drafting of assessment diagrams contribute significantly to this problem. Certain improvements can be made in drafting techniques used in the Bureau which will reduce drafting backlogs and enable maintenance assessment processing to be expedited. It is also believed that modifications can be made in the methods of designing street lighting systems which will further improve productivity.

The current standards of illumination used for new street lighting systems provide for a much higher level of illumination in residential areas than was used prior to 1972. The Bureau should analyze the street lighting requirements in the City of Los Angeles and update the City's standards of illumination taking into account the need to provide adequate lighting, to conserve energy, and to minimize costs.

The Field Operations Division is well supervised and appears to be operating efficiently with the exception of the supplies and warehousing function. This function has been reviewed as part of a City materials management study which has recommended significant improvements. Some improvements have been made resulting in a reduction of \$96,088 in the budget requirements for 1977-78. In spite of the supplies and warehousing problems, the Division has been able to keep up with a significantly increasing work load without adding personnel.

Because the Affirmative Action Program in the Department of Public Works has, for the most part, been administered centrally by the Bureau of Personnel, it has been difficult to realistically evaluate the affirmative action accomplishments of individual bureaus. There is a need for clarification of the division of responsibility between the Bureau of Personnel and the operating bureaus regarding affirmative action matters. At the time of the management audit, an in-depth affirmative action survey of the Bureau of Street Lighting was being conducted by the Personnel Department. The Department's report will provide specific information regarding affirmative action matters in the Bureau.

RECOMMENDATIONS

It is recommended that:

The Board of Public Works:

1. Instruct the Director of the Bureau of Accounting to assign accounting personnel to analyze the Bureau of Street Lighting's accounting operations and develop improvements as necessary.
2. Instruct the Director of the Bureau of Street Lighting to submit as part of the annual budget request:
 - a. A listing of all Systems Replacement Projects to be designed and to be constructed each year during the next five years. Systems Replacement Projects to be designed during the ensuing fiscal year should be listed in departmental priority order as determined by technical evaluation criteria.
 - b. A listing of the Energy and Cost Conservation Projects to be designed and constructed each year during the next five years, including a listing in priority order of projects to be designed and constructed during the ensuing fiscal year.

The Director Bureau of Street Lighting:

3. Assign a staff member to review record management programs already existing in departments, such as Recreation and Parks and the City Clerk's Office, for possible adaptation in the Bureau of Street Lighting.
4. Conduct an analysis of the Personnel Utilization Report during the current fiscal year, and develop proposed modifications to improve the system in time for consideration during the 1978-79 budget preparation and adoption cycle.
5. Take necessary action to improve productivity of Engineering Services functions by:
 - a. Analyzing field and office activities pertaining to the development of street lighting systems with a view towards eliminating or combining work efforts where possible to simplify and expedite the design and administrative work involved.

- b. Reassigning personnel in the engineering divisions, when necessary, to handle fluctuations in workload.
6. Improve productivity in the Drafting Services Section by analyzing current practices and developing and implementing improved work methods and procedures. Areas of particular concern should include:
 - a. Implementing the procedures and photographic techniques to expedite preparation of assessment diagrams and construction plans as outlined in this report.
 - b. Analyzing other drafting activities including the problem areas mentioned in this report, and developing and implementing more efficient procedures.
 7. Reduce the duplication of similar types of sample electrolier conversion projects in various areas throughout the City in the Bureau's Energy and Cost Conservation Program in order to expedite the evaluation of lighting conversion alternatives and achieve the anticipated program benefits at an earlier date.
 8. Analyze the street lighting requirements of the City of Los Angeles, and update the City's standards of illumination taking into account the need to provide adequate lighting, to conserve energy and to minimize costs.
 9. Prepare manuals covering warehouse operations and warehouse use, with specific procedural instructions governing these operations.

STATUS AND EVALUATION

Administrative Services Division

The Administrative Services Division is responsible for a variety of staff services including budget preparation, personnel services, purchasing and fiscal administration, clerical and stenographic services, training, forms control, legislative analysis, work order processing, Federal employment administration, and correspondence and records procedures. The 1977-78 Budget authorizes 14 positions for this Division.

A review of the functions assigned to this Division reveals that, in general, responsibilities are carried out adequately and in compliance with applicable Executive Directives and CAO rules.

A high personnel turnover, lack of technical expertise in accounting operations and records management, plus an increase in administrative requirements caused by programs such as CETA, Affirmative Action, and other Federally funded programs has caused difficulties in keeping up with the workload. In some cases, reduced capacity exists in the functions of records management, purchasing, fiscal, and accounting operations. Improvements are needed in records management and accounting operations.

Accounting Operations

Work done by the Bureau of Street Lighting for other bureaus in the Department of Public Works (e.g., Engineering, Street Maintenance) and the Traffic Department is not adequately controlled using the accounting procedures currently in effect.

The Bureau of Street Lighting does much of its engineering work on projects primarily controlled by the Bureau of Engineering, Bureau of Street Maintenance, and the Traffic Department. Work order numbers to control project labor and materials are administered by the primary organization responsible for the project, not the Bureau of Street Lighting. A problem exists in that project work order numbers are opened and closed by those responsible for the major portion of the work, but information concerning these numbers is not being made available to the Bureau of Street Lighting on a timely basis. Consequently, time charges to these closed projects are not valid. Pages of errors are produced on the Cost Distribution Journal controlled by the Bureau of Accounting.

A major consequence of the above practice is that large amounts of administrative labor are being expended in the Bureau of Accounting and in the Bureau of Street Lighting to reconcile these time charging errors. Bureau of Accounting personnel report that the Bureau of Street Lighting has twice as many errors as other bureaus in the Department of Public Works. Even though large errors are reconciled, many errors are transferred to continuing accounts which are accumulating approximately \$50,000 a year alone for the Bureau of Street Lighting. This means that the General Fund may not be fully reimbursed from assessments, gas tax, and other reimbursable projects.

The Bureau of Accounting is responsible for accounting operations in the Department of Public Works. Accounting system procedures and staffing used in the various Public Works bureaus directly impact this responsibility.

Past audits have recommended that the Bureau of Accounting review and evaluate all of the accounting operations performed in the Department of Public Works for the purpose of simplifying procedures and coordinating information requirements between bureaus, but the lack of available personnel and additional services furnished to others has greatly slowed progress in resolving accounting problems.

Bureau of Accounting personnel constantly advise Bureau of Street Lighting personnel on the proper preparation of accounting and financial reports, but the high turnover of administrative staff in the Bureau of Street Lighting frustrates this process. Reports are being returned back and forth between the bureaus, some up to four times for correction. Bureau of Street Lighting personnel have difficulty in understanding accounting practices now in effect.

Some Bureau of Accounting personnel indicate that instead of clerical and administrative personnel performing the accounting operation, a full-time Accountant should be assigned to the Bureau of Street Lighting to investigate the accounting practices and implement improvements. See Recommendation No. 1.

Records Management

The Records Management function is not carried out in an effective manner. For example, the forms control activity has not been assigned for over two years; the centralized filing system is obsolete and does not permit timely retrieval of needed materials; the records retention and record storage functions have not been assigned for approximately seven years; and there

is a lack of technical expertise in records management in the Bureau.

In the past few years, several attempts were made by different administrative and clerical personnel to improve the Bureau's records management operations, but little headway has been made because of the increasingly complex nature of these information handling operations (e.g., the increased volume, implementing new computerized applications).

Preliminary analysis indicates that an existing program, such as found in the Recreation and Parks Department and the City Clerk's Office might be used as a model for the Bureau of Street Lighting. See Recommendation No. 3.

Personnel Utilization Report

In the 1971 Management Audit Report, it was recommended that functional time reporting categories in the Bureau be analyzed and modified to provide more useful information to assist all levels of management in scheduling and controlling the work in the Bureau, and to assist both Bureau and City Administrative Office personnel in planning and budgeting activities to meet Bureau objectives. Approximately three years ago, through the combined efforts of personnel in the Bureau, the City Administrative Office and the Data Service Bureau, an expanded Personnel Utilization Report (CAO-25 and 26) was developed. The new report was designed to conform with the requirements of the City's Modified Program Budget format. The report was tested during the latter part of FY 1974-75, and FY 1975-76 was the first complete year in which this new reporting system was used.

The Personnel Utilization Reports are usually available to the Bureau five days after the end of each reporting period. This is much more timely than the availability of reports produced in previous years. Although Bureau personnel have stated that the new reporting system is useful to them, only the time reporting portions of the system have been useful for budgeting purposes. The productivity information has limited utility in its present form. One of the problems with the reporting system is that the functional breakdown is too detailed and contains too many subactivities. A second problem is a lack of consistency in the productivity measures which makes it impossible in many instances to use the productivity information.

At the time that CAO approval was granted to initiate the new reporting system, the Bureau was instructed to analyze these problem areas and make further refinements to the system by

reducing the number of subactivities and making other appropriate modifications. Bureau management recognizes the need for such changes but has made only limited modifications to the system to date. In order to improve the usefulness of the Personnel Utilization Report, both as a management tool for the Bureau and for budgeting purposes, the Bureau should formulate a plan to analyze and improve this reporting system. See Recommendation No. 4.

Engineering Services

General

Street Lighting engineering services are currently performed by three engineering divisions. The General Engineering and Assessment Engineering Divisions perform street lighting design, drafting, assessment procedural work, and related engineering support activities. The Technical Services Division performs special project work and some engineering support activities.

Engineering Services functional activities include:

- * Designing, drafting, and administering construction of new street lighting systems--which includes handling change orders, and maintaining liaison between the Bureau, the lighting contractors and the Bureau of Contract Administration.
- * Designing, and drafting street lighting installations to modernize and improve the existing street lighting system in conjunction with programs where other public agencies have primary responsibility. This includes street improvement, traffic signal and intersection improvement projects, street maintenance, storm drain, and sewer projects.
- * Approving design and administering construction of projects constructed by private developers under Class "B" Permits.
- * Arranging with the Department of Water and Power for installation or removal of utilitarian lighting.
- * Designing, drafting and administering construction of street lighting systems to improve or replace existing obsolete or deteriorated lighting systems.
- * Processing assessment procedures for both installation and maintenance of street lighting systems.

- * Drafting installation and maintenance diagrams for street lighting assessment projects.
- * Maintaining maps and records, providing reproduction services, and processing records for billing.
- * Providing other engineering support activities including cost estimating, project and program development, preparation of construction specifications, project coordination and agreements, and project and research investigations.
- * Developing and implementing an Energy and Cost Conservation Program.

As was noted during the previous management audit, high quality work is produced by the engineering divisions of the Bureau. Public relations and Bureau representation at public hearings is handled exceptionally well. Design plans, assessment diagrams and other project documents are well prepared, but overall productivity has been low in recent years.

Productivity

With the exception of the Energy and Cost Conservation Program, for which the main effort was initiated during 1976-77, the other categories of engineering services activities performed by the Bureau have remained essentially the same for many years.

The volume of work involved in performing nearly all of the engineering services functional activities listed above is dependent upon the number of street lighting posts designed. This is due to the fact that whenever a post is designed, a number of other technical and administrative functions must be performed in the engineering divisions. These include planning the work, providing necessary plans and other supporting documents, insuring that construction will proceed smoothly, and performing related work.

When street lighting projects are designed, some of the other engineering support activities which must be performed before or after the design work include: project and program development, preparation of construction specifications, cost estimating, construction engineering, processing of records for billing, and maintenance of maps and records. The engineering services staffing required to perform these support activities is generally proportional to the volume of the posts designed. When assessment projects are designed, additional support activities include assessment procedures processing and preparation of installation and maintenance diagrams. Activities such as

BUREAU OF STREET LIGHTING

Posts Designed vs. Engineering Services Staffing

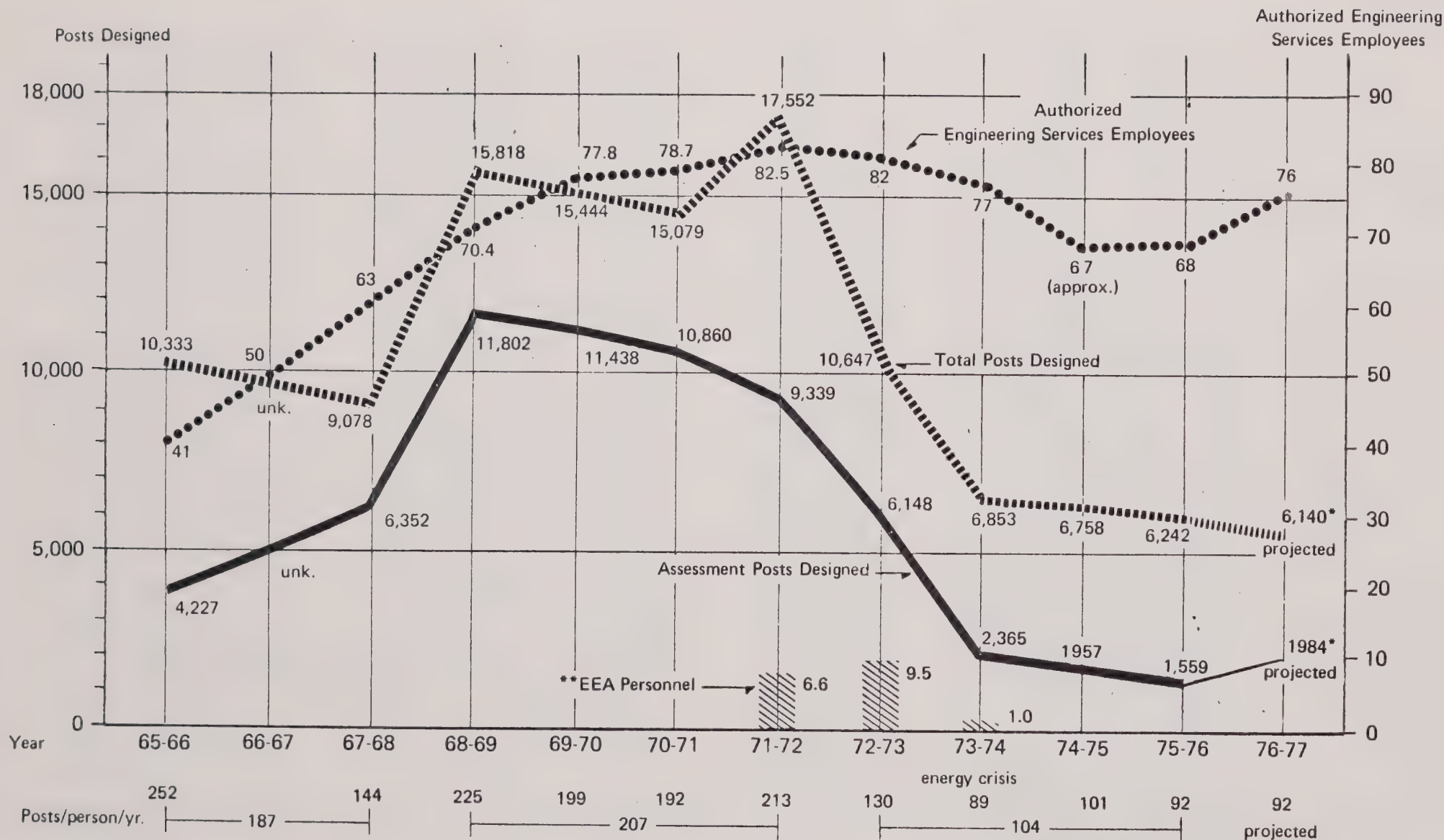


EXHIBIT A.

**Annual equivalent EEA personnel assigned to reduce backlogs in Engineering Services functions.

*Projected annual production for 1976-77 based upon actual figures through Period 10.

project investigations, preliminary cost estimates, development of maintenance agreements, evaluation of equipment and materials, legislative analysis and utilitarian lighting investigations are not related to the number of posts designed. These activities have always been performed by regularly authorized engineering personnel to the degree necessary, however. Special project assignments, such as the Fixed Object Elimination Project and the current Energy and Cost Conservation Program, have been undertaken by the Bureau from time to time with the required additional staffing provided for in the budget.

For the purpose of analyzing the productivity changes in the Bureau's Engineering Services activities, a production unit was selected by the Audit Team to represent Engineering Services accomplishment over a period of years. The number of street lighting posts designed was selected because, as mentioned above, the design work ultimately generates work requirements for nearly all of the other Engineering Services activities in the Bureau, and because it has been continually available through the years.

Although the character of the Engineering Services functions in the Bureau has remained essentially unchanged during the past several years, the volume of work has fluctuated considerably. An analysis was made of the volume of Engineering Services production in terms of total posts designed, which includes posts designed for assessment projects, and the staffing levels in terms of budgeted positions for this work during the past eleven years, from fiscal year 1965-66 through 1975-76. The analysis indicated that staffing was increased significantly to handle increases in the activities of the engineering divisions during the first seven years when workload was increasing, primarily due to a surge of large assessment projects initiated by Council resolution. Only minimal staffing reductions were made during the next four years when the workload was sharply reduced. Exhibit "A" graphically illustrates the relationship of Engineering Services production in terms of posts designed and authorized Engineering Services employees during this time period.

In terms of percentages, during the first seven year period, production increased by approximately 70% and the number of Engineering Services employees was increased by 100%. During the next four year period, however, production decreased by approximately 64% but the number of Engineering Services personnel was reduced by only 18%.

A comparison of the Engineering Services productivity level during the four peak years, 1968-1969 through 1971-72, with the most recent complete four year period, 1972-73 through 1975-

76, and the authorized staffing for those same periods as shown in Exhibit "A" indicates a significant reduction in overall productivity during the latter period. During the peak period, the average production was 15,973 posts per year, versus production of 7,625 posts per year during the recent four year period. The average authorized Engineering Services staffing for the same periods was 77.4 and 73.5 respectively. This represents a 52% reduction in production and only a 5% reduction in staffing.

Thus, the overall Engineering Services productivity during the most recent four year period is only 50% of what it was during the four peak activity years. Work accomplishment declined from an average of 207 posts per person per year during the four peak years to an average of 104 posts per person per year during the recent four year period as shown at the bottom of Exhibit "A". The projected work level for FY 1976-77, based upon production through April 9, 1977, indicates the continuation of a relatively low level of Engineering Services activities.

Bureau personnel have indicated that more time is currently required to perform certain Engineering Services activities than was the case in previous years. For example, Bureau representatives state more time is now required to handle protests and to resolve other citizen problems relating to large street lighting assessment projects, and for the processing of projects involving Federal funds. In addition, more time is required to sustain the existing electrolier lighting system due to the fact that more lights are in service now than in previous years. Some additional time is also required now to show substructure information on plans. The number of additional personnel required to perform this additional work is not great, however. Therefore, even though some additional time is now required to perform certain functions in the engineering divisions compared to that required in past years, these additional requirements are relatively small in relation to the total effort of all Engineering Services personnel.

In view of the reduction in the level of engineering activity in recent years, action has been taken in the 1977-78 budget to adjust the Engineering Services staffing to bring it more realistically in line with the production level which may be anticipated in the foreseeable future. A total of 18 position authorities have been deleted from the new budget, mostly from the Engineering Services area. In order to accommodate this change, improvements must be made in the manner in which engineering services functions are currently performed. The Bureau has recently taken action to improve one of its design procedures relating to the preparation of plans for traffic

signal and street lighting modifications at intersections. These plans are developed jointly by the Bureau and the Traffic Department. Under the new procedure, the previous requirement calling for the ink drafting of the lighting design and design notes which are originally prepared in pencil has been discontinued. The elimination of this duplication of work will reduce drafting backlogs and expedite completion of these plans. The Bureau should further analyze current design and administrative methods and procedures and implement other changes where appropriate to improve productivity of Engineering Services functions. See Recommendation No. 5. In the following report section specific recommendations are made for improving productivity in drafting activities.

Drafting Services

The Drafting Services Section prepares construction plans and assessment diagrams, updates plans, maintains maps and records and processes records for billing. Construction plans are required for all electroliter lighting installations. If all or a part of the cost of construction or maintenance is to be assessed to benefitting property owners, assessment diagrams are also required.

For all street lighting assessment jobs, assessment diagrams which show the location of the street lights in relation to property ownerships must be prepared for use by the Bureau of Assessments. There are two types of assessment diagrams. Installation diagrams are used to determine the assessments to property owners for the construction of the lighting systems. Maintenance diagrams are used to determine the assessments to property owners for the annual operation of the lighting systems.

A major problem currently faced by the Bureau is the delay encountered in preparation of maintenance diagrams for the "Z" Series (small assessment maintenance districts being initially assessed). The Administrative Code specifies that benefitting property owners in new street lighting assessment districts may not be initially billed for street lighting maintenance for a period exceeding 36 months from the time the system was energized. Therefore, all technical and administrative work associated with these projects, including the drafting and procedural work by the Bureau of Street Lighting, the determination of benefit footage and spreading of assessments by the Bureau of Engineering, the approval of ordinances by the Office of the City Attorney, and the procedures involved in arranging for the collection of the assessments by the Los Angeles County Tax Assessor should be completed within this time period. In recent years there have been delays of as long as 24 months before the maintenance diagram drafting has been

completed. This often resulted in total "Z" Series processing time extending beyond 36 months.

In addition to the need to revise drafting priorities in support of the street lighting projects included in the Public Works Accelerated Program, one of the main reasons for the "Z" Series drafting backlog is the length of time involved in the preparation of base maps for the assessment diagrams. The base maps for these diagrams are similar in scale and content to the Bureau of Engineering's district maps (DM's). The diagrams are, with rare exception, 100 scale maps which include property lines, dimensions, tract names, street names, and map reference numbers. The City's DM's contain the same information to the same scale. Because the DM's usually also show street center lines and survey and other information in the center of the street which the Bureau is not interested in, new base maps for assessment diagrams are drawn by Bureau drafting technicians. This task is time consuming and expensive, and as mentioned above the resulting drafting backlog is a major factor causing the delay in "Z" Series assessment processing.

By using different procedures, the time required for preparation of base maps, and hence the time to produce assessment diagrams, can be significantly reduced. Instead of redrawing the base maps, photographic techniques can be used to modify the DM's to eliminate unwanted information shown in the center of the streets. The modified DM's can then be updated to show recent changes in property ownerships and used directly as base map tracings for assessment diagrams. Base map tracings for construction plans on larger jobs can also be created using this technique. The following procedure is recommended to accomplish this:

1. Obtain a film negative of the area required for a given assessment diagram from the vault tracing of the DM.
2. Remove center lines and other unwanted information from the negative with opaquing fluid.
3. Have the film negative photographically converted to a film positive.
4. Add the new lot cuts not shown on the DM, the project name, the map number, etc., to complete the base map tracing.
5. Add the street lights, conduit, and other necessary information to complete the assessment diagram tracing. An additional film positive of this diagram tracing may

be made at this time if a separate tracing of the same area will be required later.

This technique can be used efficiently for a substantial portion of small jobs as well as for the large multi-sheet jobs. An inspection of assessment diagrams on file in the Bureau of Assessments indicates that frequently, even for jobs showing only a small number of lamp locations, the diagram may cover a substantial portion of the diagram sheet. Therefore, the use of photographic techniques will require less time than manually drafting the base plans using present methods except for maps covering very small areas. A break-even point will have to be determined as to when the use of photographic techniques will require less time than manually preparing the base map. The criteria however, should be based upon the size of the diagram required and not on the number of lamps to be shown.

The above technique should then be carried one step further to produce the base map tracings for the construction plans for the larger multi-sheet jobs. This can be accomplished by taking the film negative previously used to produce the base diagram tracing, blanking out the areas between the streets which are not required for construction plans and then converting to a film positive. This work should be carefully planned in advance so that the assessment diagram sheets are laid out as multiples of the construction plan sheets.

When using photographic techniques to modify DM's to create base plan tracings for assessment diagrams and for construction plans, it may be advisable to establish a planning and control function in the Drafting Services Section. A suggested means of accomplishing this would be to designate a position with the working title of "Graphics Coordinator". The employee assigned to work in this capacity would determine the overall drafting requirements for each job, plan the sequential steps to produce the required tracings most efficiently, schedule the work assignments and monitor the progress of the jobs.

After the above procedures have been implemented it should be possible to reduce the backlog of drafting work to an acceptable level and handle the drafting of construction plans and assessment diagrams on a timely basis. The drafting of assessment diagrams should then no longer be a significant factor in causing delays in "Z" Series processing.

Personnel in the Bureau recognize that problems exist in the drafting area and have taken action towards resolving a number of them. For example, a "Z" Series Project Control Chart has been developed which lists all "Z" Series projects and

indicates dates when various processing steps are completed. The chart is updated every two weeks and a summary analysis indicates where backlogs occur so that action may be taken to expedite the processing. The Drafting Services Section has recently initiated a program of converting the hard copies of its maintenance diagrams to microfilm records. When completed, this project will facilitate retrieval of this information and will save considerable floor space since the cloth prints of these diagrams are currently filed in large bulky binders. Another time consuming drafting function is the revision of existing maintenance diagrams. Because the scale of available maps, such as tract maps, of areas which must be added to existing maintenance diagrams is oftentimes different from the scale of the original diagram, extra time is required to plot these new areas. In its 1977-78 Budget request, the Bureau is requesting that a variable enlargement tracing table be purchased to reduce the time involved for this work.

Certain other drafting practices observed during the audit appeared to be time consuming in terms of drafting effort. For example, instead of furnishing sketches of field construction changes made in connection with change orders, some of these changes are formally drafted. Sometimes excessive rechecking of detailed information on the original installation diagrams is done when street lighting assessment projects are modified.

The Bureau is not currently taking advantage of drafting services which are available from the Bureau of Engineering. Beginning in 1973, the Bureau of Engineering, in their new mapping program, began producing base maps and special overlays for City departments which had need for maps with special purpose information pertaining to their department. The Bureau of Street Lighting was included in this program and street lighting system map overlays were being provided which were of much better quality than the present maps. The Bureau discontinued participation in this program after about a year and a half. This program should be reinstated. Bureau representatives stated that they plan to discuss the possibility of resuming this procedure with the Bureau of Engineering.

As mentioned above, the Bureau is taking action to improve some drafting problems but there is more that should be done. It is recommended that Bureau personnel develop and implement more efficient methods and procedures in the Drafting Services Section. The drafting of base map tracings for assessment diagrams and construction plans should be expedited by using the procedural steps and photographic techniques outlined above. An analysis should also be made of other current drafting operations with a view towards developing and implementing more

efficient methods and procedures where appropriate, including improvements in the problem areas mentioned in this report. See Recommendation No. 6.

Street Lighting Information File

The Street Lighting Information File (SLIF) is an automated inventory of the City's street lighting system. It was developed as a sub-system of the Inventory of Elements of the Traffic System under a Federal Grant from the Office of Traffic Safety. In this system, four Department of Traffic files and one Bureau of Street Lighting file interact to provide various types of information to users. The objective of SLIF is to provide an accurate inventory of street lighting in the City and specific characteristics about the lighting systems.

At the present time, there is a backlog of about 17,000 electroliner records to be entered. This represents approximately 10% of the electroliners on the streets, therefore the data base is not current. In addition, there are approximately 25,000 mismatches of information involving SLIF and related Traffic Record System files. This represents inaccuracies in approximately 15% of the existing records. These problems currently limit the usefulness of the SLIF subsystem by the Bureau. Information retrieved from SLIF pertaining to large areas of the City's lighting system is of some use to the Bureau as general indicators of the street lighting inventory and characteristics. Information pertaining to smaller areas, however, is oftentimes not sufficiently accurate or complete for the Bureau's needs.

The Bureau is currently taking action to correct the deficiencies in the SLIF system. An additional employee has been assigned to reduce the input record backlog, and the Bureau's data processing specialist has recently corrected a critical programming problem and is also making headway in resolving the mismatch problem. In addition, plans are now being made to provide for a follow-up consultant contract to further improve both the Traffic Department and the Bureau of Street Lighting portions of the system.

Energy and Cost Conservation Program

Seven professional employees were authorized in the current budget to staff the Energy and Cost Savings Section in the Bureau. In addition, 1.8 positions have been provided for drafting and other support of this activity. The Bureau has initiated an Energy and Cost Conservation Program in accordance with the instructions of the Public Works Committee of the City

Council in April, 1976. The main elements of this program as set forth in a report adopted by the Board of Public Works on March 11, 1977, include:

1. The identification, development and evaluation of equipment.
2. Sample Electrolier Conversion Projects. This is a listing of projects areas where there is a potential for achieving energy and cost savings by converting existing lighting to more efficient types of lighting. These projects are distributed throughout the City in each Council district.
3. An Electric Rate Analysis to develop, in conjunction with the Department of Water and Power, additional rates for various types of lighting.
4. A Utilitarian Conversion Program to convert some existing utilitarian lighting to more efficient lighting.
5. Development of a system to poll residents to obtain public reaction regarding the different types of lighting proposed in the conversion program.

The Bureau has made some progress in all of the main elements of the program during the current fiscal year and has completed design for a substantial portion of the sample conversion projects. It is the Bureau's intent to establish sample lighting projects in each Council District to convert various categories of existing lighting to more efficient lighting sources, and then conduct a cost benefit analysis to determine which types of lighting to use in a full scale program to reduce street lighting energy consumption and operational costs. A relatively high degree of citizen involvement is anticipated prior to making the lighting decisions.

The program appears to be worthwhile and it has the potential of generating significant reductions in energy consumption and savings in the operating costs of the City's lighting systems. The concern of the Audit Team, however, is the relatively slow rate of progress made to date. Five positions were authorized in the Bureau's 1975-76 budget to work on the program. Very limited progress was made during that year because most of the personnel were reassigned to work on street lighting projects in the Public Works Accelerated Program. According to the Bureau's current schedule, the completion of all sample lighting conversion projects and the cost benefit analysis will

extend into the next fiscal year. It appears that reliable figures pertaining to the overall cost and the anticipated benefits of a full scale program may not be available until the third quarter of 1977-78.

A question arises as to the need for the Bureau's proposal to design and construct sample electrolier conversion projects in industrial areas, on arterial streets, and in residential streets in so many locations in the City during the evaluation program. The Bureau's current plans call for setting up 190 sample projects throughout the City and converting or modifying approximately 3,000 lighting fixtures to different lighting sources for the evaluation program. There appears to be no need to test industrial area lighting in 15 different locations in the City, and to test lighting of arterial streets in 83 locations, and residential lighting in 71 locations in order to evaluate the alternative lighting sources. Instead of doing this, it is recommended that the Bureau's sample conversion program be scaled down to include a much smaller number of conversion projects. With a reduced program, street lighting test areas can still be constructed for each lighting category in several geographic areas of the City--in typical industrial areas and arterial streets, for example, and in a variety of different types of residential areas within the City.

By using a smaller number of sample project areas, the gathering of information and determination of cost benefit figures should be expedited so that the City can begin a full scale program and realize a reduction on energy consumption and a savings in operational costs at an earlier date. See Recommendation No. 7. Other comments pertaining to the program are mentioned below.

An important factor relating to energy and cost conservation which the Bureau apparently has not pursued is whether its current standards of illumination for street lighting design are appropriate. Through the years, it has been the practice of the Board of Public Works to adopt the roadway lighting standards proposed by the Illuminating Engineering Society (IES) whenever new standards are developed. The most recent standards were published by the Society and adopted by the Board in 1972. These standards, which represent a revision of the 1963 standards, specify a doubling of the amount of illumination on all streets in residential areas.

To our knowledge, no cost-benefit studies have been made by the Bureau to justify the doubling of residential lighting on Los Angeles streets--either in terms of night time criminal activity, night time traffic accidents in residential areas or

other criteria. The 1972 standards were developed by IES prior to the 1973 energy crisis and during a period of intense electrical promotion by power companies. Due to the energy shortage and the fact that approximately 25% less electrical energy is required to operate residential lighting under the 1963 IES standards than under the 1972 standards, it is suggested that the Bureau review the illumination requirements for the City of Los Angeles. A determination should be made as to what standards of illumination are most appropriate, taking into account both the lighting needs and the need to conserve energy and reduce costs.

A single standard of illumination to be applied throughout the entire City for each category of lighting is not necessarily the answer. In certain areas or under certain conditions, the levels of lighting prescribed by the 1972 standards might be appropriate, and in other instances lower levels may be indicated. It appears inconsistent for the Bureau to be engaged in an extensive program to determine means of conserving energy while at the same time designing and installing all new lighting systems in residential areas so that they provide at least twice as much illumination and require 25% more energy to operate than the existing lighting on most residential streets.

There may be another potential benefit to the Bureau if illumination standards are reviewed and adjusted downwards. In view of the fact that the level of requests for new street lighting is much lower now than it has been in previous years, perhaps more new street lighting systems will be requested in the future if the "street lighting package" can be made more attractive to the public through lower cost systems. See Recommendation No. 8.

Street Lighting Systems Replacement Program

In September, 1975, the Mayor instructed the Board of Public Works to coordinate the preparation of the annual assessment proceedings to maintain and operate the Los Angeles City Lighting District with the preparation and adoption of the City's budget. Two specific requirements were included in the instruction. The first was to prepare and submit a preliminary version of the annual ordinance of intention to finance the work to maintain and operate the Street Lighting System in accordance with the provisions of Administrative Code Section 6.97. The second requirement was to prepare and submit a list of Systems Replacement Projects to be designed and constructed utilizing the systems replacement revenues resulting from assessments levied in accordance with Administrative Code Section 6.96.

The first requirement has been complied with. The Bureau of Street Lighting has submitted, beginning with the 1976-77 budget request, preliminary versions of the annual ordinance of intention, and these documents have been well prepared. The second requirement, however, has not yet been complied with.

Section 6.96 of the Administrative Code provides that a portion of the annual street lighting maintenance assessments may be levied for the purpose of replacing obsolete lighting equipment. It has also been determined that the costs associated with that portion of the Bureau's Energy and Cost Conservation Program relating to the conversion of existing equipment in the electrolier lighting system to more efficient lighting sources may also be paid for under the provisions of Section 6.96.

From time to time, the Bureau obtains approval from the Board of Public Works to design and construct systems to replace existing obsolete and deteriorated lighting systems. Selection of systems to be replaced is determined by using technical evaluation criteria to determine projects with greatest need for replacement on a City-wide basis. Programs for replacement of obsolete lighting systems are not currently submitted in conjunction with the Bureau's annual budget requests, however.

Action should be initiated to fully comply with the Mayor's instructions to provide the Mayor and Council and the City Administrative Officer with complete information pertaining to the Bureau's long range and short range programs for projects authorized under the provisions of Section 6.96 of the Administrative Code. To provide for the inclusion of this information each year in appropriate budget documents, it is recommended that the Board of Public Works instruct the Director of the Bureau to submit a list of Systems Replacement Projects, and a list of Energy and Cost Conservation Projects to be designed and constructed as part of the annual budget request. See Recommendation No. 2.

Field Operations Division

The Field Operations Division repairs the City's electrolier street lighting system and constructs new or improved lighting at intersections under programs initiated by the Bureau and the Traffic Department. It relocates the electroliers for the Bureau of Street Maintenance and other agencies in connection with public improvement projects and upon request from private citizens. The Department of Water and Power maintains the street lighting system including changing bulbs, cleaning the electroliers and doing emergency repairs at night. The

Department of Water and Power also installs and maintains all utilitarian street lighting in the City. Most new street lighting systems and systems being modernized are constructed by private contractors.

The Division is organized geographically into three districts: North, South and Central. Also, the Division is supported by a Staff and Clerical Support Section and a Warehouse Services Section. Although there are three districts, all crews work out of the Santa Monica Boulevard yard except one crew assigned to the Valley facility located at Raymer Street. The assignment of personnel is evenly distributed to the three districts with the exception that several one and two man specialty crews are assigned City-wide as needed. The boundaries of the three districts have been established to equalize the workload as nearly as possible; however, in the event that an unusual workload develops in one district, division management reassigns crews as necessary.

The number of electroliers in service has increased in the past 10 years approximately 54% from 114,000 to 175,000. The number of work orders for all work performed has increased during the same 10 years from approximately 3,000 to nearly 8,500. At the same time the number of field personnel has remained fairly constant at 50 to 55. The work of the Division consists of new construction, damage repair, and failure repair. New construction declined from 810 posts installed in 1965-66 to 530 posts initiated in 1975-76. Damage repair work orders increased from 1,150 in 1965-66 to 1,593 in 1975-76. Failure repair work assignments increased from 1,647 in 1965-66 to 6,505 in 1975-76. The Division continually looks for improved techniques and equipment to accomplish the increased work load without additional personnel. The greatest improvement has been the equipping of crews with compressor trucks and power equipment.

Warehouse Services

The need to acquire and warehouse parts for the repair of approximately 150 styles of street lights has become a significant problem. Although the City has functional specifications established for street lighting, there are numerous design styles which can be built to meet those specifications. Consequently, numerous styles of street lights have been built and turned over to the City for operation. For each style of street light, the Bureau must maintain a supply of spare parts for repairs. This problem could be checked or eventually reduced by establishing a limited number of styles which the City would permit to be built. The eventual conversion

of old systems to these styles as replacement is required would help alleviate the problem.

The supplies and warehousing function is inadequate to meet the needs of the Bureau. In February, 1976, the consulting firms of J. K. Lasser and Company and Ferguson, Leung and Company submitted a supplemental audit for fiscal 1974-75. In the report, the consultants reviewed the supplies and warehousing function in the Bureau of Street Lighting as well as in other bureaus and departments. The findings reported by the consultants are still valid at this time. Based on the recommendations of the Lasser/Ferguson, Leung study, the City employed Touche Ross and Company to make a City-wide materials management study. The Touche Ross and Company study recommended improvements in materials management which will greatly assist in resolving the problems in the Bureau of Street Lighting. The recommendations will be successful only to the extent that they are fully understood, implemented, and maintained by those persons who must work directly with the system. Some improvements have been made resulting in a reduction of \$96,088 in the budget requirements for 1977-78.

The Bureau of Street Lighting maintains a manual perpetual inventory on a limited group of items. The inventory is maintained on record cards which are updated daily by recording items which have gone out of the warehouse or have been returned to stock. This type of inventory is used by some businesses and is quite successful if it is coupled with rigid warehouse controls, prompt and accurate posting to the cards, and regular evaluation of material usage and reorder levels. However, the Bureau of Street Lighting does not have the procedures and controls necessary to support the perpetual inventory system.

Some of the weaknesses of the system include: many items of stock are actually less than shown on the inventory cards; due to a lack of access control, crews take stock which may not be recorded; stock items may be returned or salvaged and not recorded on the inventory card; items are signed to a truck but not removed from inventory on the assumption that this will be done when the item is used; items may be salvaged from a project and be recorded on the inventory card but subsequently dismantled for parts and discard. Many items are stored at Raymer Street without adequate records. See Recommendation No. 9.

AFFIRMATIVE ACTION

Since the inception of Affirmative Action programs in the City, the responsibility for the development and administration of the program in the Department of Public Works has been primarily assumed by the Bureau of Personnel. Because most of the work has been performed centrally for the Department as a whole, it has been difficult to realistically evaluate the affirmative action accomplishments of individual bureaus.

There is a need to clarify or restructure the division of responsibility between the Bureau of Personnel and the operating bureaus regarding affirmative action goal setting, the development of action programs, and reporting procedures. The Personnel Department has been working with the Bureau of Personnel to accomplish this, but these matters have not yet been resolved. Until they are resolved, it is believed that evaluations of the effectiveness of affirmative action efforts in the Department of Public Works must be based primarily on an evaluation of the Bureau of Personnel's program.

Since the Personnel Department was conducting an in-depth affirmative action survey in the Bureau of Street Lighting at the time of the management audit, the audit team did not duplicate this effort. The Personnel Department's report, when released, will provide specific information regarding affirmative action matters in the Bureau.

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